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FLORA W. PATTERSON

DISEASES OF GRAINS AND FORAGE CROPS

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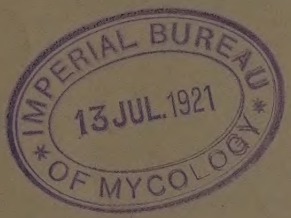

NEW JERSEY

AGRICULTURAL

Experiment Stations

CIRCULAR 51

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NEW JERSEY
AGRICULTURAL EXPERIMENT STATIONS
CIRCULAR 51

Diseases of Grains and Forage Crops*

The smuts are among the most injurious diseases of our grains, and are the causes of heavy losses in New Jersey and throughout the country. The most important of the grain smuts are the loose smut of oats, the loose smut of wheat, the stinking smut or bunt of wheat and the smut of corn. These diseases are all due to fungi which are very similar in general appearance and behavior, but which have different life histories and, therefore, require different treatments to insure their control.

Loose Smut of Oats.

(Ustilago avenæ (Pers.) Jens.)

This very common and well known disease occurs on the growing oats at the time of heading, causing the destruction of the grains and more or less of the chaff and the formation of a powdery black mass. This black powder is composed of the spores of the fungus by which it is carried from year to year. It is carried by the wind and more or less of it catches on the grains of the healthy plants. The loss due to this disease is very large, frequently amounting to 10% or more of the crop. The loss for the entire United States has been estimated at $20,000,000 per year.

TREATMENT. The fact that the spores of the fungus are carried on the outside of the healthy grains makes it possible to use a treatment which will kill the spores without injuring the grains. The most convenient treatment is with formalin (or formaldehyde) which can be purchased from the druggist at 75 to 90 cents per pound, or in large quantities much cheaper. One pound in 50 gallons of water will be sufficient for 50 bushels of grain. Spread the grain on a clean floor and sprinkle or spray thoroughly with the solution. Shovel the grain into a pile and cover with canvas or burlap for from 6 to 12 hours and then spread out to dry. The

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drying process may be hastened by mixing with air-slaked lime, which may be removed by the fanning mill. There are other treatments, but none more satisfactory, convenient or economical than the formalin. The fumes of the formalin are irritating to the nose and eyes, but not injurious.

Loose Smut of Wheat.

(Ustilago tritici (Pers.) Jens.)

This disease of the wheat is very similar in general appearance to that of the oats, but its life history is somewhat different. It spreads from diseased to healthy plants at time of flowering and penetrates the young grains.

TREATMENT. The fact that it is carried within the grain instead of on the outside, and that it is impossible to distinguish the healthy from the diseased grains, makes the formalin treatment unsatisfactory. By far the most satisfactory and economical method of preventing the disease is to secure seed from uninfected fields, but when it is desirable to maintain a particular strain of seed, a modification of the Jensen hot water treatment can be used. This method as devised by Freeman and Johnson is as follows: Clean the seed thoroughly and soak for 5 to 7 hours in water at 63° to 72° Fahrenheit. Put the grain in loose bags or wire baskets holding about one-half peck each for further treatment. Use two galvanized iron tubs, holding from 20 to 40 gallons, filled with water. Tub No. 1 should be kept at a temperature ranging from 110° to 120° Fahrenheit, and tub No. 2 at about 126° to 129° Fahrenheit. Plunge each bag or basket into tub No. 1 for one minute and then into tub No. 2 for ten minutes, keeping the grain well stirred during the entire time. Two men can treat about one bushel of grain per hour. The seed can be dried on a barn floor, but if the weather is cool it should be protected from frost.

The slowness of the hot water treatment makes it impracticable to treat any considerable amount of grain. However, the grower will find it practicable to treat a small amount of seed which can be sown in a separate field and the crop used for seed a second year. Such a field should be at a considerable distance from wheat known to be infected, or should be separated by a woodland or other wind-break to prevent infection by means of spores carried by the wind.

Stinking Smut or Bunt of Wheat.

(Tilletia fœtans (B. & C.) Trel.)

(Tilletia tritici (Beij.) Wint.)

This disease is quite different in appearance from the loose smut. It fruits in the grain only, and therefore is frequently not noticed

until threshing time. The diseased grains are frequently shriveled, greenish in color, and when broken are found to be filled with a mass of black spores which have a peculiar, disagreeable odor. The fungus not only destroys the grain of the diseased plants, but the diseased grains are mixed with the healthy thus making the entire crop worthless for milling and frequently for stock feed.

TREATMENT. The spores of the fungus are carried on the outside of the grain and attack the young plants. This makes it possible to treat the seed with formaldehyde in exactly the same manner as recommended for the treatment of oats for loose smut.

Corn Smut.

(Ustilago Zeæ (Beckm.) Ung.)

This very common disease is well known by the black masses of spores on the ears, tassels and frequently on stalks and leaves. It occasionally causes heavy losses in field corn and is frequently very destructive on sweet corn. It has been found to be very severe in two localities in this State. The spores of the fungus are carried from season to season in the old stalks, in the manure from live stock fed on the diseased plants, and possibly on the grain.

TREATMENT. Do not use manure from animals fed on diseased plants on corn land. Burn the refuse from fields where the disease is prevalent. Practice crop rotation.

Loose Smut of Barley.

(Ustilago nuda (Jens.) Kell. & Sun.)

This very common disease sometimes causes a loss of 10 per cent. of the crop. Usually the entire head and sometimes the upper leaves are smutted. The heads are first covered with whitish or grayish membranes which break and release the powdery masses of brownish or blackish spores. It bears a very striking resemblance to the "loose smut" of wheat.

The treatment is the same as for the "loose smut" of wheat.

Corn Wilt.

(Pseudomonas stewartii E. F. Smith)

This is a bacterial disease which may cause the plant to wilt and dry up at any time in its growth. The root remains normal but the veins in the stems become yellow and then black. If the stems are cut cross-wise, drops of yellow, viscid material ooze from the veins. The disease is most severe on sweet corn. It may be carried in the seed, in diseased stalks and in manure.

The disease can be controlled by selecting the seed from healthy plants, by burning the old stalks and by avoiding the use of manure

from stock fed on diseased corn for land to be put in corn. The greatest care should be taken in selecting seed corn. Slightly infected plants will produce and carry the disease.

Other Corn Diseases.

A *root rot* of young corn is occasionally reported to us but does not appear to be a serious disease. *Ear rots* are also occasionally reported but thus far have not proved serious.

Grain Rusts.

The grain rusts are fungus diseases which are very common, especially on our wheat and oats. They cause reddish brown and black patches on the stems and leaves and sometimes on the heads, and no doubt reduce the yield.

There are no satisfactory methods of controlling these diseases, except the growing of resistant varieties. They receive practically no attention from our New Jersey farmers.

The timothy rust is also occasionally found in New Jersey but cannot be considered of importance.

Powdery Mildew of Wheat.

(Erysiphe graminis D. C.)

The fungus appears on the leaves as a whitish, flour-like covering. It is quite common and sometimes injurious in wet shaded spots. Rye, barley and oats are also subject to the attacks of the mildew. Conditions favorable for the development of the fungus should be avoided.

Wheat Scab.

(*Gibberella saubinetii* (Mont.) Sacc)

In this disease the fungus attacks the immature heads producing yellowish or pinkish incrustations at the base and over the spikelets. The diseased parts turn yellow and ripen prematurely; grains are more or less shrunken and sometimes covered with a thick felty mass of the fungus. It sometimes causes considerable loss in the maturing crop; it also attacks the seedling plants, and kills 5 per cent or more. Seed from a diseased crop should not be sown.

Black Mold of Wheat.

(Cladosporium sp.)

This disease occurs on and causes a pronounced blackening of the heads and considerable loss.

Alfalfa Leaf Spot.

(Pseudopeziza medicaginis (Lib.) Sacc.)

This disease is a very common one on alfalfa and is usually more abundant on the later cuttings. It may, however, cause considerable loss on the first cutting according to recent observations in this State. The early symptoms are the appearance of small sooty, brown or black spots on the upper surface of the leaves. those toward the base being attacked first. These spots vary in diameter up to about one-sixteenth of an inch.

When the spots are very numerous, the leaves are killed and drop from the plant. The loss may amount to 50 or 75 per cent of the foliage in cases of some infections. The vigor of the plant is greatly lessened, and death may result from repeated attacks of this disease.

CONTROL. No method is known for successfully controlling the disease once it has become established. If infection is quite severe, the crop should be cut before the leaves begin to die and drop from the plant. Any practicable means of cleaning up and destroying dead stalks, fallen leaves, etc., should serve to lessen the amount of infection.

Other Leaf Spots of Alfalfa.

There are some other diseases of alfalfa which may be designated as "leaf spot" diseases, but which are quite distinct from the one just described. These are of comparatively infrequent occurrence and may pass unnoticed by any except the more careful observer. Of this class may be mentioned the *Cercospora, Ascochyta,* and *Stagonospora* leaf spots, named according to the particular organism producing the disease.

There is also a white leaf spot which has been quite prevalent in some fields. The leaves are irregularly spotted with whitish areas of varying size which at first suggest the work of insects. This is not the case, however, and all studies so far have failed to reveal any causal organism. Plants thus affected stand out prominently in the field and later the leaves turn yellowish and become dry.

Anthracnose of Alfalfa.

(Colletotrichum trifolii Bain).

This disease is characterized by the blackening of the crowns. Black spots also occur on the stems but these are only indicative of the trouble lower down. On affected plants either part or all of the stalks are attacked. The first symptoms are a general wilting of the stalks, followed later by death due to the girdling at

the base brought about by the action of the fungus on the stem tissues. Clean seed selection appears to be helpful.

Other Diseases of Alfalfa.

Wilt (*Sclerotinia libertiana Fckl.*), root rot (*Rhizoctonia medicaginis* DC), and "damping off" of alfalfa seedlings (*Pythium de baryanum* Hesse) are diseases which may develop on alfalfa plants with consequent injury and loss.

Diseases of Clovers.

Leaf Spot (*Pseudopeziza trifolii* (Pers.) Fckl.). This is a disease of little importance, though occasionally infections may be quite severe. The symptoms are the same as in alfalfa leaf spot, except that spots may appear on both surfaces of the leaf. Methods of control are the same as for alfalfa.

Stem Rot (*Sclerotinia trifoliorum* Eriks.) In this disease a decay is produced at the base of the plant, as a result of which the plant wilts and dies. Crimson clover seems to be particularly susceptible to this disease and many cases were reported in New Jersey in 1913 and 1914. Rotation of crops is important in the control of this disease.

Anthracnose (*Colletotrichum Trifolii* Bain) attacks red clover, while alsike is practically immune. It produces black spots on stems, rarely on leaves. Cultural methods play no part in control. Clean seed selection seems important.

Rust (*Uromyces trifolii* (Hedw.) Lev). This disease attacks all clovers and is some times more serious than the leaf spot, depending a great deal upon climatic conditions. It is characterized by small yellowish brown pustules on the lower surface of the leaves and on the stem. These pustules bear the spores which spread the disease. No control measures are known.

Sooty Spot (*Phyllachora trifolii* (Pers.) Fel.) This disease causes black, more or less circular spots on leaves. It is most common on red and on white clover. It may kill the leaves where severe infection occurs. No control measure is known.

Note:—The introduction of a new crop and the devoting of large areas to its production, introduces many new problems in plant diseases. These new diseases may ravage the crop before they are thoroughly understood and before control measures can be developed. It is, therefore important that any indications of abnormal conditions in alfalfa and other crops should be reported to the Plant Pathologist as soon as observed.